Writing Assembly programs in Keil 5

(Version 1.5)

10/22/2017

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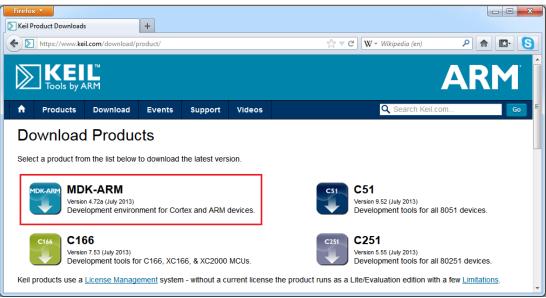
BIHE University

Contents

Downloading and installing the Keil IDE	3
Installing Legacy support package for ARM7	5
Creating an Assembly project in Keil	6
Building	.10
Debugging and Tracing	.10

Downloading and installing the Keil IDE

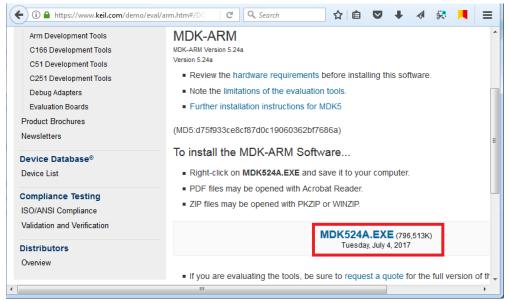
- 1. Click on the following link: https://www.keil.com/download/product/
- 2. Choose MDK-ARM.



3. Fill out the form and then click on the *submit* button, at the bottom of the page.

Firefox ARM Version 4.72a Evaluation Software .	
keil.com https://www.keil.com/	
Software & Hardware Products ARM Development Tools C166 Development Tools C51 Development Tools	ARM Software Microcontroller Development Kit Version 4.72a Complete the following form to download the Keil software development tools.
C251 Development Tools Debug Adapters	Enter Your Contact Information Below
Evaluation Boards Product Brochures Newsletters	First Name:
Device Database® Device List	E-mail:
Compliance Testing ISO/ANSI Compliance Validation and Verification	Company: Address:
Distributors Overview	City:

4. Click on the *MDKxxx.EXE* link.



5. Choose Save.

Opening MDK524a.EXE	×
You have chosen to open:	
MDK524a.EXE	
which is: Binary File (778 MB) from: http://az717401.vo.msecnd.net	
Would you like to save this file?	
	Save File Cancel

6. Execute the downloaded file. Installing the software is straight forward; choose the *Next* button in each step, until the setup finishes.

Installing Legacy support package for ARM7

7. Open the following link and click on Legacy Support for ARM7, ARM9 & Cortex-R.

()	1DK v4 Legacy Sup) www2.keil.com/1	mdl:5/legacy	~	C C	Search	☆	≜ ⊽	+ 4	L 👷	
C	Products	Download	Events	Support					Q Sea	rch Keil.cc
	Home / MDK Version 5 / Legacy Support MDK Version 5 uses Software Packs to support a microcontroller device and to use middleware. To maintain backward compatibility with MDK Version 4 you may install Legacy Support. This might be necessary for two reasons:									
	 To maintain projects created with MDK Version 4 without migrating to Software Packs. To use older devices that are not supported by a Device Family Pack. Legacy support for ARM Cortex-M devices Legacy support for ARM7, ARM9 & Cortex-R 									
4		rnload Legacy S for Cortex-M Dev Version 5.24		1		nload Legac RM7, ARM9 8 Version 5.2	Cortex-R			 MDK Ov Getting Middlew

http://www2.keil.com/mdk5/legacy

8. Install the downloaded file.

Creating an Assembly project in Keil

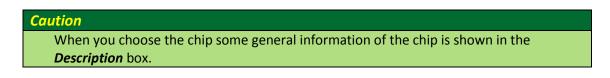
- 9. Open the Keil IDE by clicking on its icon on the desktop.
- 10. Choose *New uVision Project* from the *Project* menu.

W μVision4		
File Edit View	Project Flash Debug Peripherals Tools S	VCS Window Help
i 🗋 💕 🖌 🥬	New µVision Project	: 🚎 //= //🙀 🙆 EINTO_I
Project	New Multi-Project Workspace Open Project Close Project	
	Export Manage	* *
	Select Device for Target Remove Item	Alt+F7
Build Output	Clean target Build target Rebuild all target files	F7 🕂 🖬
<	Batch Build Image: Stop build	Ctrl+F7
		h

11. Create a new folder and Name it *OurFirstProject*. Type the name *ourFirstProject* for the project and click *Save*.

🔣 Create New Project	×
😋 🕞 🗢 🔰 🕨 OurFirstProject	← 4 Search OurFirstProject ♀
Organize 🔻 New folder	≣≕ ▾ 🔞
Favorites Name	Date modified Type No items match your search.
Downloads Secent Places MazidiBooks	
⊿ Music ✓ Job	
UDATASHEETS	
Google Drive	······································
File <u>n</u> ame: ourFirstProject Save as <u>t</u> ype: Project Files (*.uvproj)	• •
lide Folders	Save Cancel

12. Select *Legacy Device Database* from the combo box. Then, in the *Database* tree, click on the *NXP* and choose *LPC2368*. Then press *OK*.



Select Device for Target 'Target 1'		x
Device		
Legacy Device Database [no RTE]		
Vendor: NXP		
Device: LPC2368		
Toolset: ARM		
Search:		
	Des <u>cription</u> :	
LPC2362 LPC2364 LPC2365 LPC2366 LPC2367 LPC2368 LPC2377 LPC2377 LPC2378 LPC2387 LPC2387 LPC2388 ✓	ARM7TDMI-S based high-performance 32-bit RISC Microcontroller with Thumb extensions, 512KB on-chip Flash ROM with In-System Programming (ISP) and In-Application Programming (IAP), 58KB RAM, CPU clock up to 72 MHz On-chip crystal oscillator, On-chip 4MHz RC oscillator, On-chip PLL Enhanced Vectored Interrupt Controller, Ethemet 10/100 MAC with DM USB 2.0 Full Speed Device Controller, CAN 2.0B with two channels, General purpose DMA controller, Four UARTs, one with full modem interface, Three I2C serial interfaces, Three SPI/SSP serial interfaces, I2S interface, SD/MMC memory-card interface, 10-bit ADC with 6 chann 10-bit DAC, Four 32-bit timers with capture/compare, Watchdog Timer,	E
	OK Cancel Hel	p

13. Click the *No* button to add the startup file to the project.

	μVision	
	Copy 'LPC2300.s' to Project Folder and Add File to Project ?	
	Yes No	
(Caution	
	In your practical projects you should choose to add the startup file, a in a separate tutorial.	s will be discussed

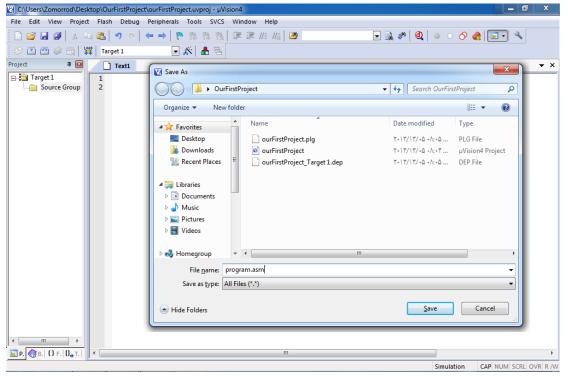
14. Make a new file by clicking on the New Icon (you can make a new file by pressing *Ctrl+N* or choosing *New* from the *File* menu, as well.)



15. Press *Ctrl+S* to save the new file. (You can also save the file by choosing *Save* from the *File* menu.)



16. Name the file as *program.asm* and save it in the *OurFirstProject* directory.



17. Type the following sample program in the file

Project 🛛 🗜 📧	program.asm*	▼ ×
🖃 🎋 Project: ourFirstProj	1 AREA A_SIMPLE_PROGRAM, CODE, READONLY	
🗄 🚂 Target 1	2 MOV R1, #0x05	
	3 MOV R2,#0x03	
	4 ADD R1,R1,R2	
	5 HERE B HERE	
	6 END	
	7	
🖻 P 🧒 B {} F 🛛 🖕 T		•

- 18. Add the *program.asm* file to the project. To do so:
 - a. Click on the + next to the *Target 1* to expand the tree. Right click on *Source Group 1* and choose *Add Existing Files to Group*.

Project		Ф 💌		progr	am.asm*			•	• ×
🛛 🖃 🔧 Project: ou	ırFi	rstProject		1	AREA	A SIM	PLE PR	OGRAM, CODE, READONLY	
📄 😓 Target	1			2	MOV F	1,#0x	05		
Sou	urc	e Group 1		з	MOV F	2, # 0x	03		
A A	Ň	Options fo	r Group	'Source	Group 1'		Alt+F7		
		Add New I	tem to (Group 'S	Source Grou	ıp 1'			
		Add Existin	ig Files t	to Group	p 'Source G	roup 1'			
•		Remove Gr	oup 'So	urce Gro	oup 1' and i	ts Files			
🔳 Р 🌏 В 🛍		Rebuild all	target f	files					•
Build Output		Build Targe	et				F7		p 🖂
4	Ь	Manage Pr	oject Ite	ms					*
	/	Show Inclu	ide File l	Depend	encies				-
•									P
Add Existing Files t	o c	urrent Proje	ct Grou	ip				Simulation	at

b. Then go to the *OurFirstProject* directory and choose *Program.asm*, press *Add* and then *Close*.

Add Files to Group 'Source Group 1'		×
Look in: 🛛 OurFirstProject 🗨	← 🗈 💣 📰 ▾	
Name	Date modified	Ту
program.asm	۲۰۱۳/۱۳/۰۵ ۰۸:۱۰	A!
<		P.
File name: program	Add	
Files of type: Asm Source file (*.s*; *.src; *.a*)	✓ Close	
,		_

Building

19. To compile click on the *Build* icon or choose *build target* from the *Project* menu.



20. If the program is built successfully the following message appears:

Build Output	џ
Program Size: Code=16 RO-data=0 RW-data=0 ZI-data=0	*
".\Objects\ourFirstProject.axf" - 0 Error(s), 0 Warning(s). Build Time Elapsed: 00:00:00	
	4
	Simulation

Debugging and Tracing

21. To start debugging click on *Start/Stop Debug Session* icon or choose *Start/Stop Debug Session* from the *Debug* menu. (or simply press *Ctrl+F5*)

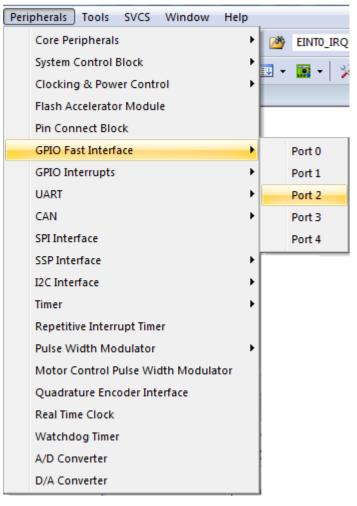


22. If it starts tracing successfully, a cursor appears in front of the next instruction to be executed.

Disasser	mbly				д 📧
<mark>⊲>0x0(</mark>	000000	E3A01005	MOV	R1,#0x0000005	A
	3:	MOV	R2,#	0x03	
0x00	0000004	E3A02003	MOV	R2,#0x0000003	
	4:	ADD	R1.R	1.R2	*
					P
	program.	asm			▼ ×
\square	2	MOV R1,#0x	05		*
	3	MOV R2,#0x	03		
	4	ADD R1,R1,	R2		
	5 HERE	B HERE		-	
•					F.

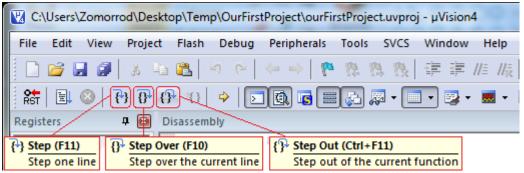
23. Go to the *Peripherals* menu. It has tools for monitoring different peripherals. For now, choose *Port 2* from *GPIO Fast Interface*. It shows the registers of **Port 2**; you can see values

of registers while tracing the program or change their values by clicking on each bit.



General Purpose Input/Output 2 (GPIO 2) - Fast Interface							
-GPIO2 FIO2DIR: 0x0000000	31 Bits 24 23 Bits 16 15 Bits 8 7 Bits 0						
FIO2MASK: 0x0000000							
FIO2SET: 0x0000000							
FIO2CLR: 0x0000000							
FIO2PIN: 0x00003FFF	~~~~~~						
Pins: 0x00003FFF							

24. To trace the program, use the *Step Over* button or click on *Step Over* from the *Debug* menu. It executes the instructions of the program one after another. To trace the program, you can use the *Step* button, as well. The difference between the *Step Over* and *Step* is in executing functions. While *Step* goes into the function and executes its instructions one by one, *Step Over* executes the function completely and goes to the instruction next to the function. To see the difference between them, trace the program once with *Step Over* and then with *Step*. When you are in the function and you want the function to be executed, it returns from the function, and goes to the instruction which is next to the function call.



25. To exit from the debugging mode press *Start/Stop Debug Session*.